

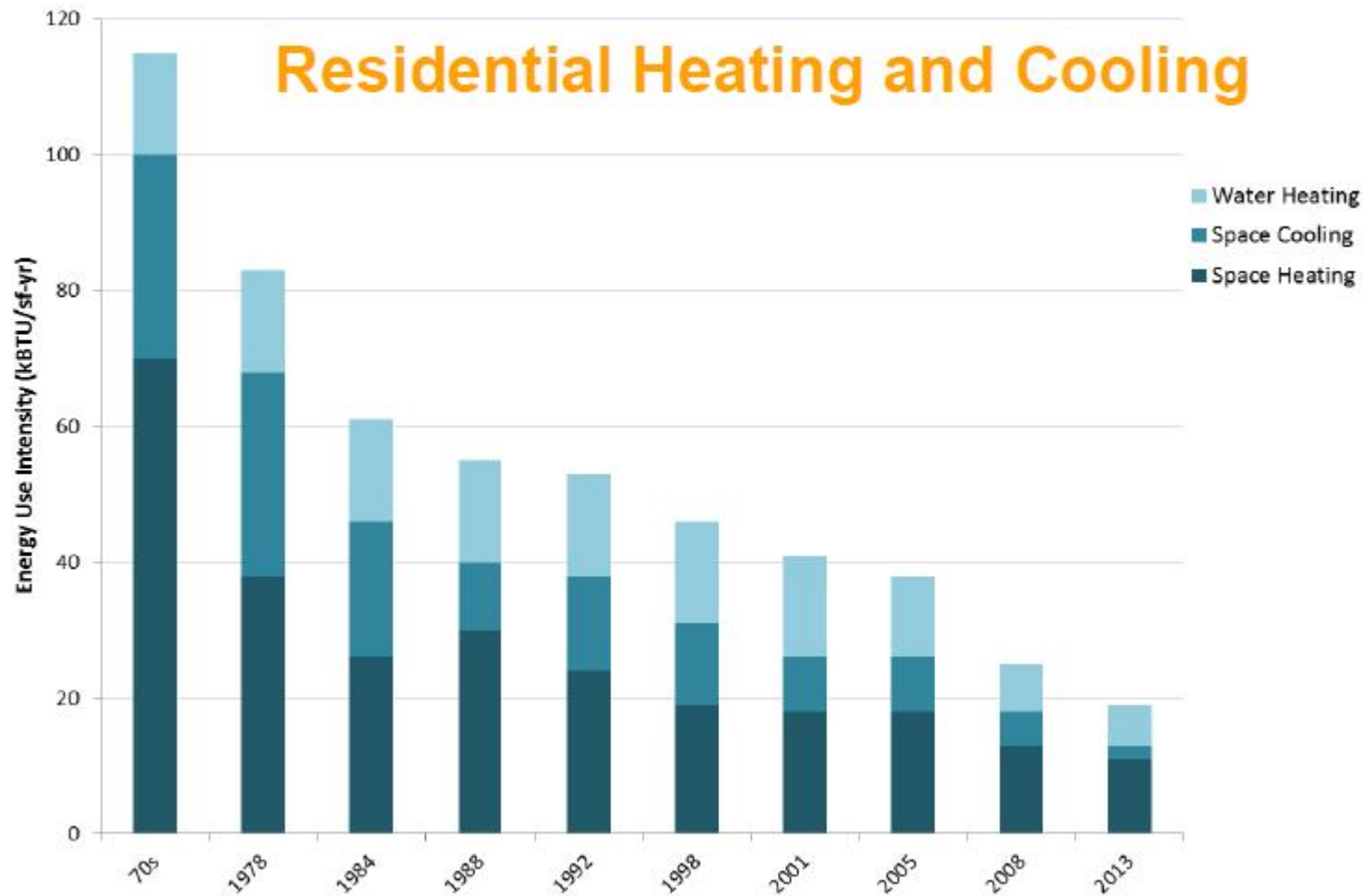


# **Cracking the Code: An Approach to Estimating Savings from Energy Codes**

**Jonathan Strahl**

**2015 IEPEC Conference — Long Beach, California**

# California building codes have demonstrated significant impacts

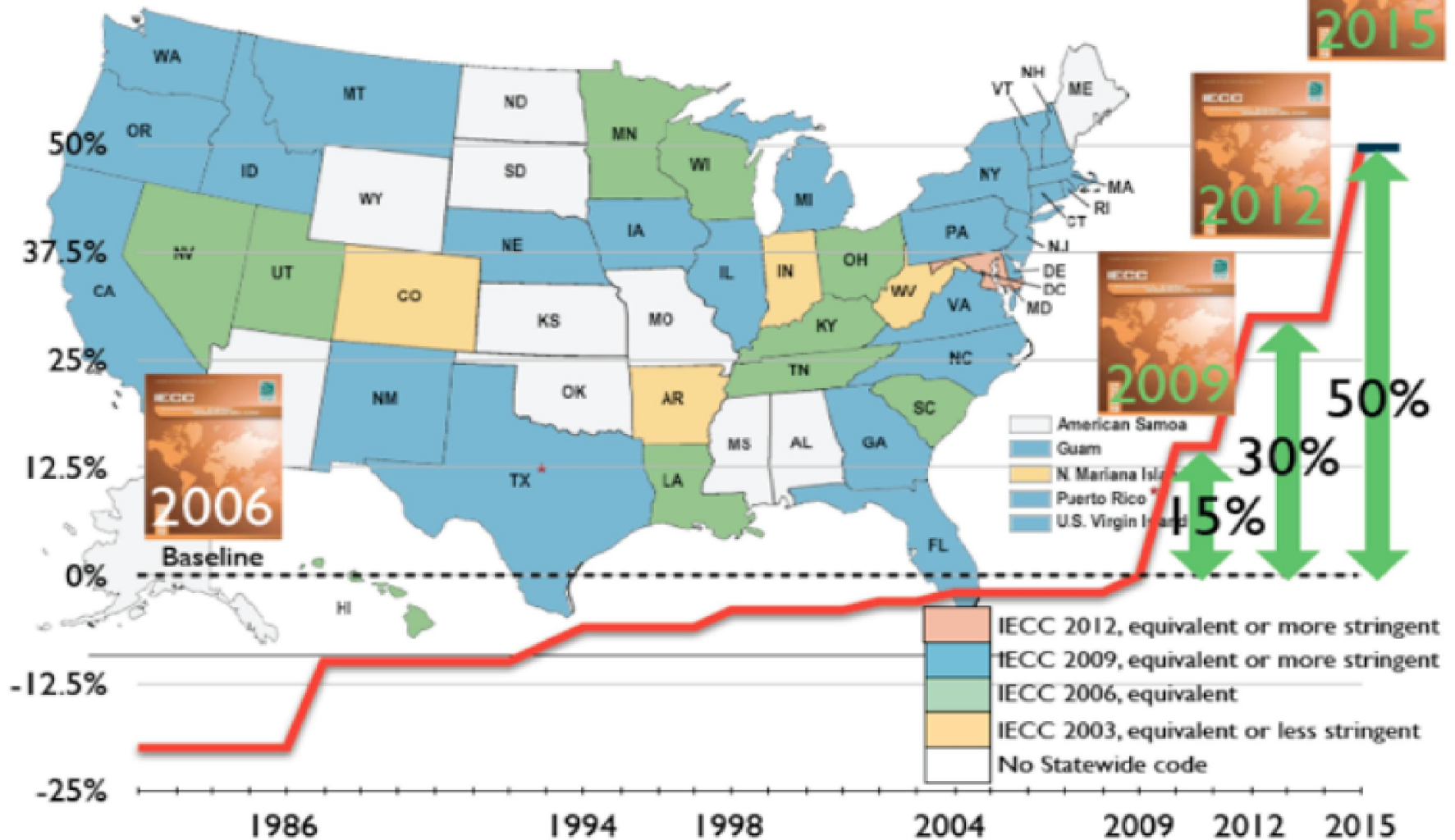


(Source: California Energy Commission and 2009 California Residential Appliance Saturation Survey. Statewide)

# Stringent codes raise the baseline— decreasing program benefits

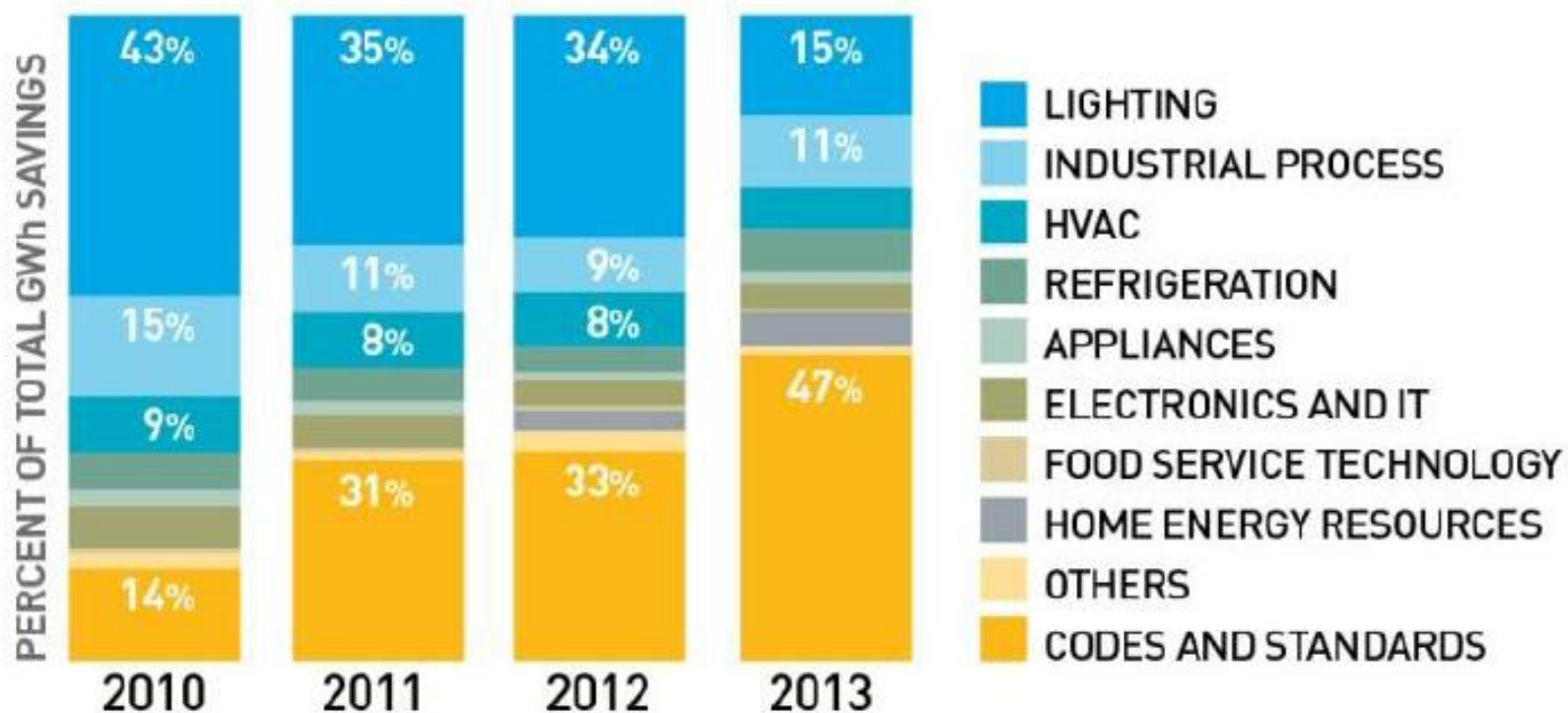
## Residential Energy Codes Improving FASTER...

Relative to 2006 IECC (International Energy Conservation Code) Baseline



Interpreted from: [www.energycodes.gov](http://www.energycodes.gov); Jan. 2012, J.Brew, RMI

# Utilities ask: How can we recoup savings being “lost” to increasingly stringent codes?



(Source: PG&E Energy Efficiency Portfolios)

# Today's talk: How do we evaluate savings from building codes?

*“An affected utility may count toward meeting the standard up to one third of the energy savings, resulting from energy efficiency building codes, that are **quantified and reported through a measurement and evaluation study undertaken by the affected utility.**”*

## ■ Codes program evaluation 101

## ■ A few unique strategies

- ☐ Scope/budget constraints
- ☐ Focus on strategies rather MWh
- ☐ No silver bullets



# Building codes pose unique evaluation challenges in Arizona

- What is the market?
  - new construction – com and res
- AZ is a home rule state:
  - Mix of IECC/ASHRAE vintages in 120+ jurisdictions
  - 4 different climate zones

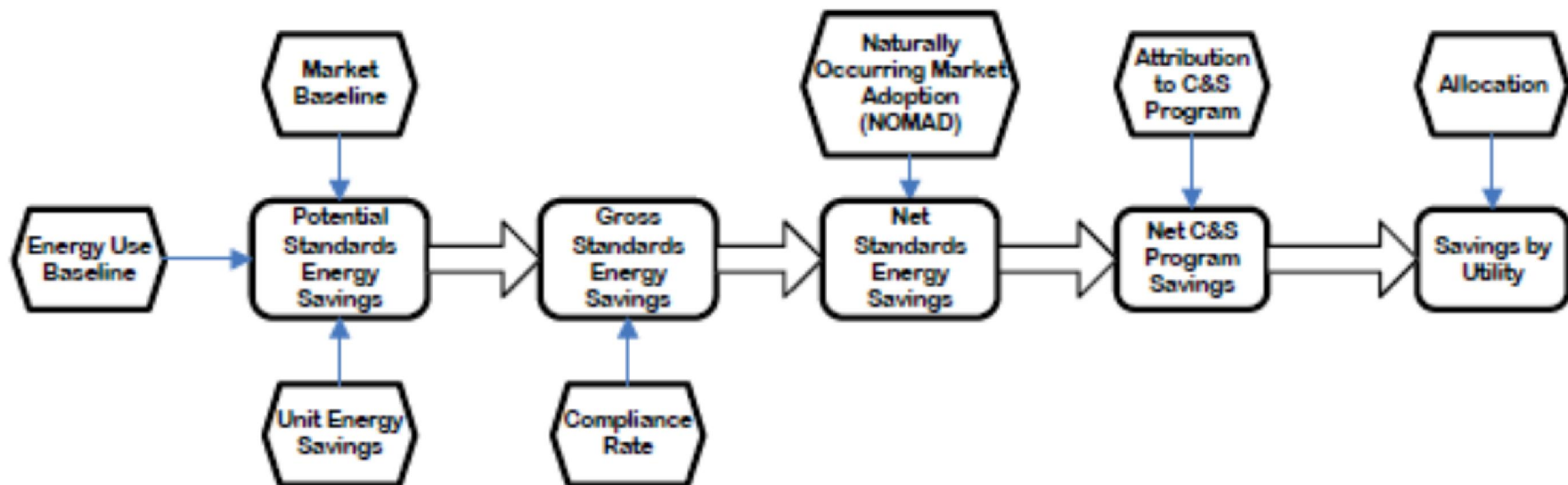


(Source: AZ Cities @ Work)



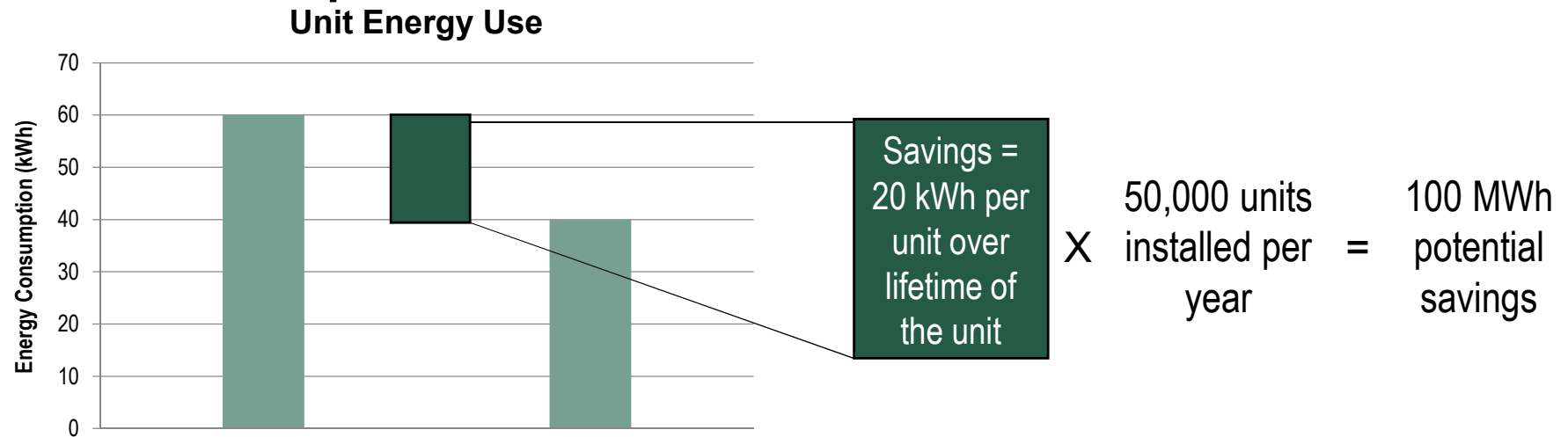
# The approach I describe today is a modified version of the California methodology

## C&S Advocacy Program Evaluation Protocol



(Source: Lee, A. et al. Utility Codes and Standards Programs: How Much Energy do they Save? 2008 ACEEE Summer Study on Energy Efficiency in Buildings)

# Developing potential savings – similar to technical potential

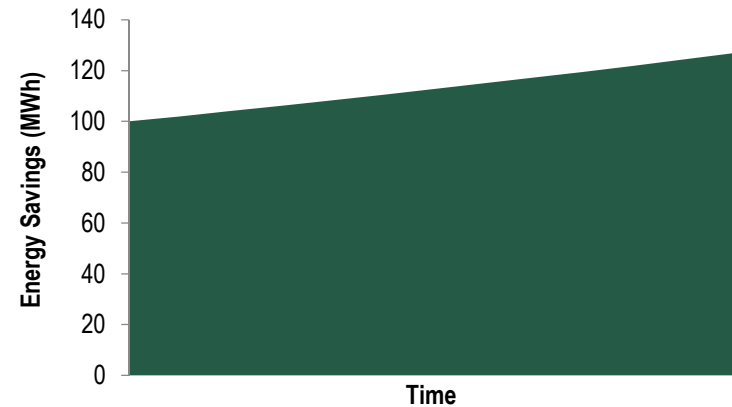


**Potential Savings Snapshot (1 year)**



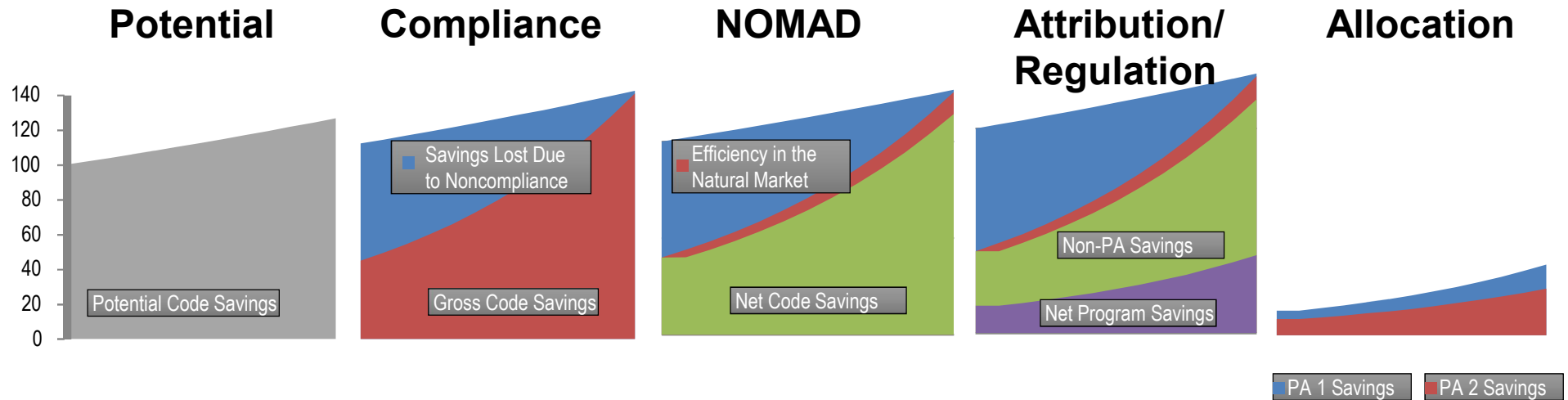
Source: Navigant

**Potential Savings Over Time (2% Market Growth)**





# The method removes various slices of savings from total potential savings



Source: Navigant

## Potential savings based on

- Construction activity
- Baseline energy consumption
- Required level of energy consumption

## Gross savings take into account

- Savings not achieved by buildings that do not fully comply

## The natural market can include:

- Early adopters of new technologies
- Code officials that encourage beyond-code construction
- Builders that choose efficiency

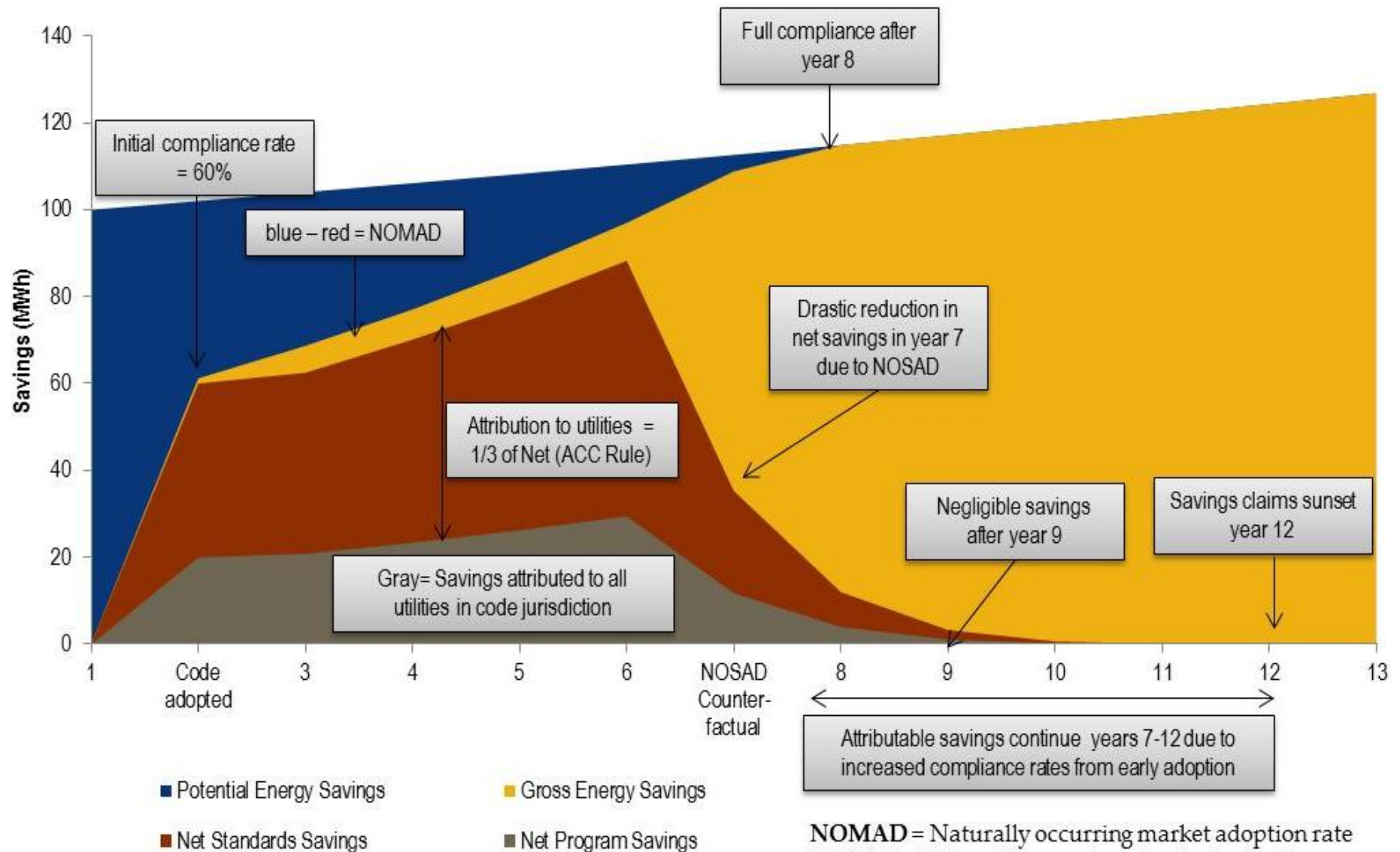
## Net program savings take into account

- Contribution of other market actors to code savings

## Program savings get allocated to PAs based on

- Relative contribution to savings

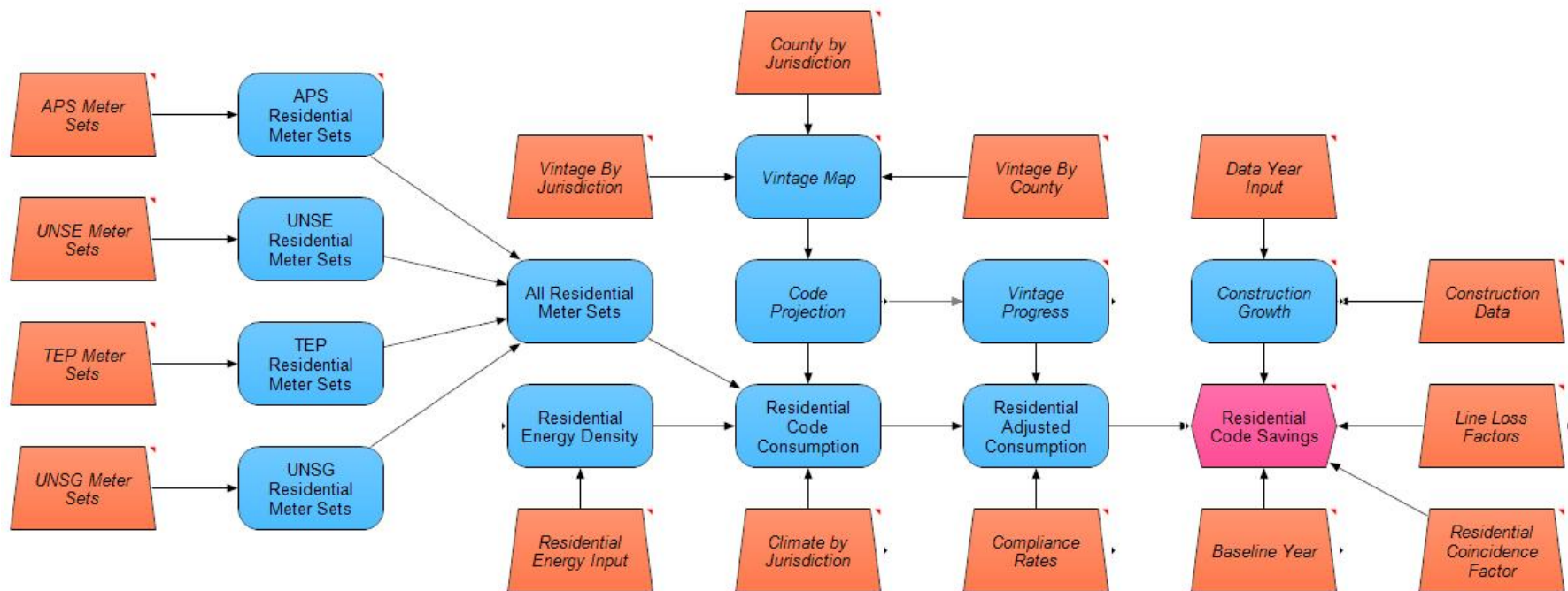
# A snapshot of the codes evaluation process over time



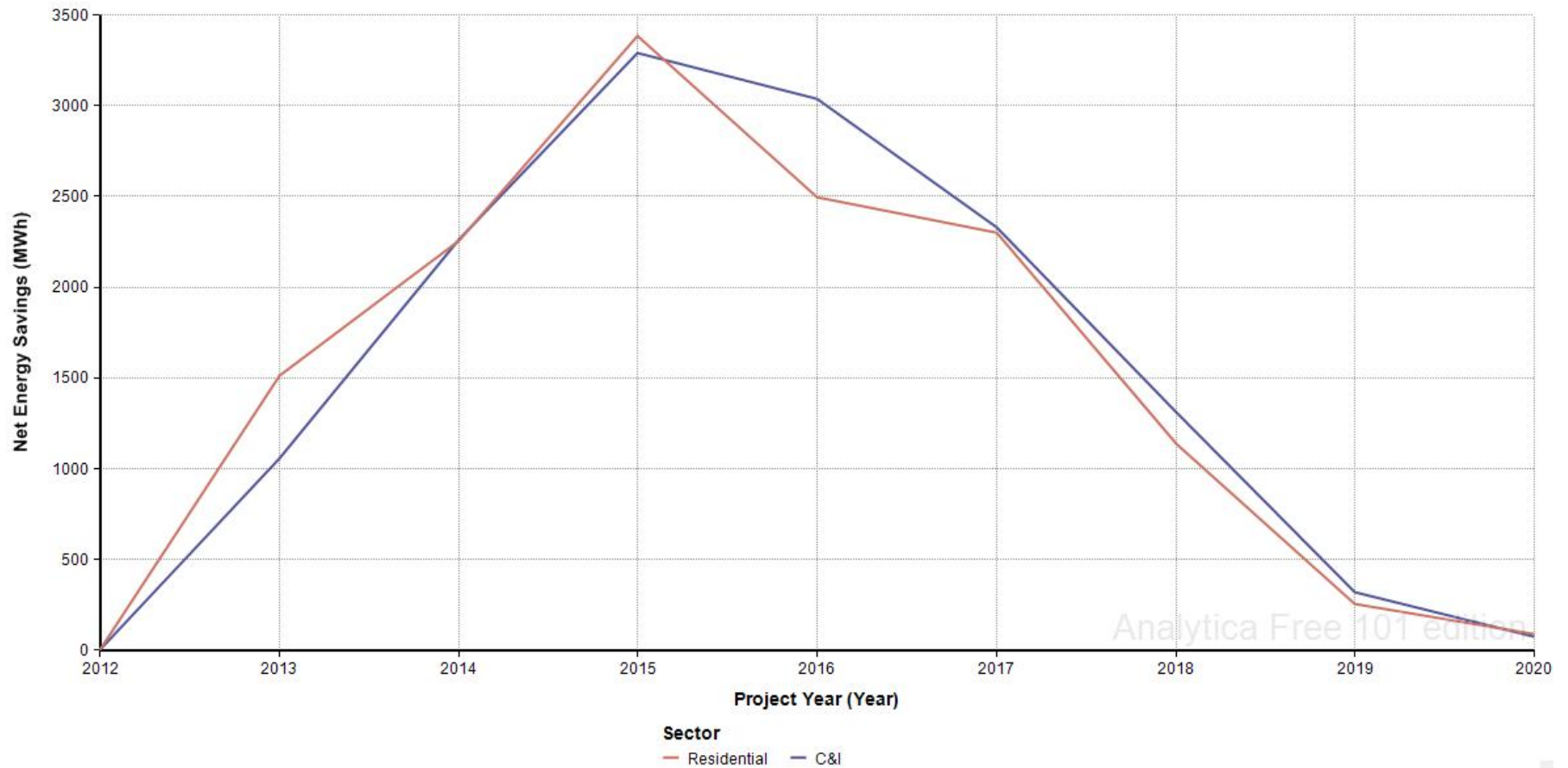
NOMAD = Naturally occurring market adoption rate  
 NOSAD = Naturally occurring standard adoption

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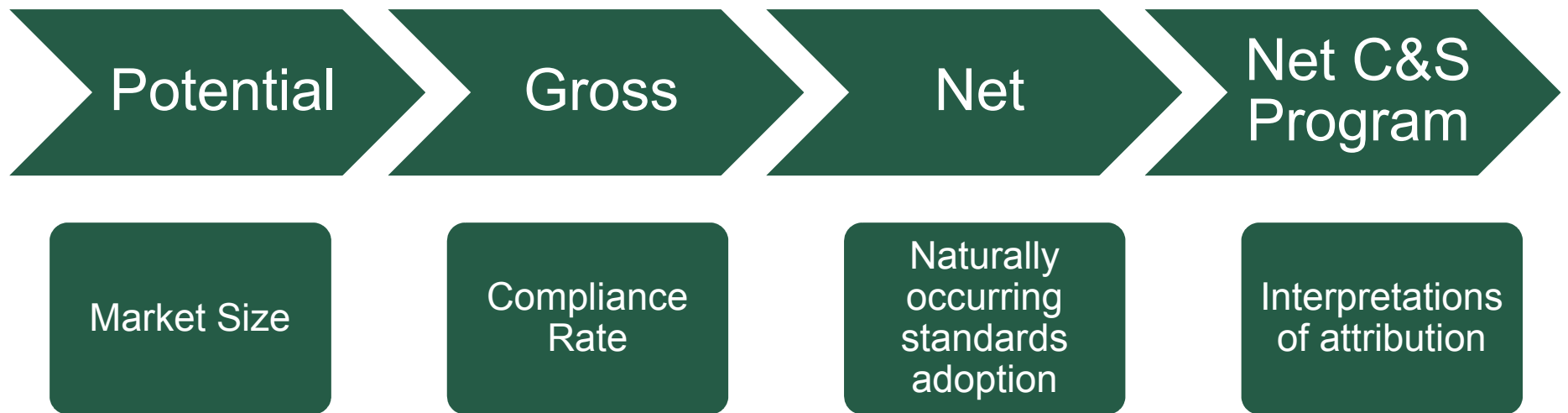
# Our model represents the multidimensional nature of the challenge



# Illustrative results from the model



Today I will share a few strategies associated with each step in C&S evaluation



# Potential savings calculation

$$\sum (NewMeters \times (kWh/year_{oldcode} - kWh/year_{newcode}))$$

- Market size → new meter installations by
  - Jurisdiction
  - Climate zone
- UEC → energy simulation modeling
  - Baseline code models (res)
  - 16 DOE commercial prototype models (com)
- Home rule state
  - Mix of code vintages





# To verify new meters: we employed a three step process for each meter

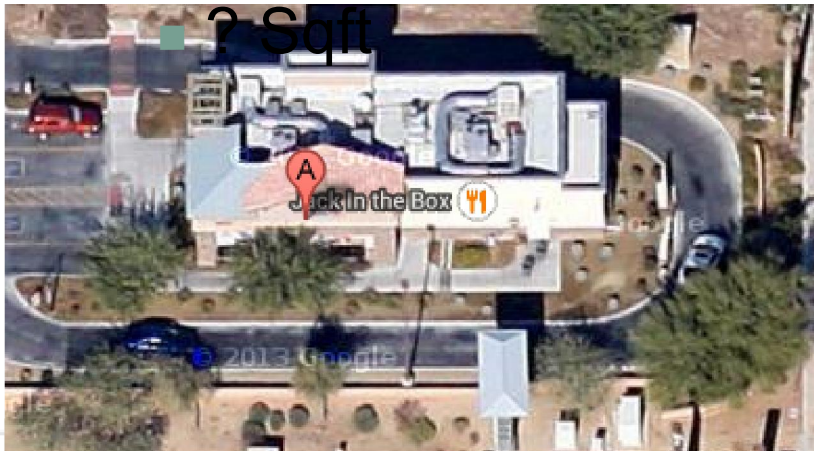
- Draw a sample, then look up the site address using an online search engine
- Categorize as Energy Star building type
  - later matched on an EUI basis to the 16 DOE prototypes
  - Different from APS reported type in 12% of cases
- Determine building size and age



# Example: Valid for claiming savings

## □ Ex Ante:

- 2009 new meter
- “restaurant” - APS
- ? Sqft



## □ Ex Post:

- 2009 confirmed
- “quick service restaurant” – DOE
- 2,455 sqft

No Photo

16900 W Yuma Road  
Goodyear, AZ  
Sales Comp  
Tenant information

Owner information

2,455 SF Bldg  
Built 2009  
Restaurant

Potential

Gross

Net

Net C&S  
Program

# Example: New meters in existing buildings

## □ Ex Ante:

- 2013 new meter
- “office” - APS
- ? Sqft

## □ Ex Post:

- 2006 – existing building
- “small office” – DOE
- 4,000 sqft

### Property Records

☐



**1953 Commerce Center Circle**  
Prescott, AZ  
Active For Lease  
Sales Comp

Historical For Sale  
Owner information

4,000 SF Bldg  
Built 2006  
Office Building



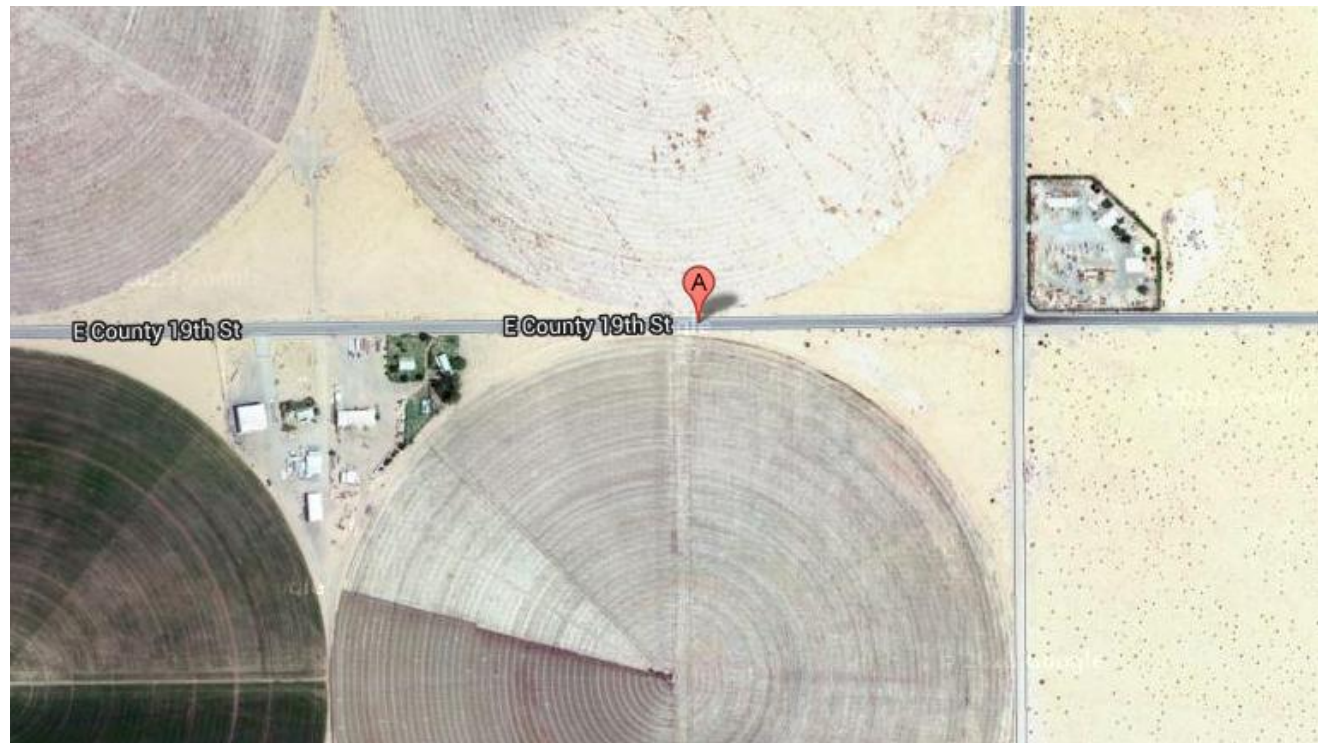
# Example: No building

## □ Ex Ante:

- 2009 new meter
- “office” - APS
- ? Sqft

## □ Ex Post:

- No building, perhaps an irrigation pump?



# Example: Empty lot – new construction?

## □ Ex Ante:

- 2013 new meter
- “retail int/ext entry” - APS
- ? Sqft

## □ Ex Post:

- Empty lot, evidence of construction activity
- Verify next year



# Gross savings accounts for compliance

$$kWh_{newcode} + ((kWh_{oldcode} - kWh_{newcode}) * Compliance Rate)$$

## ■ Residential technique:

- ☐ Compliance training pre-test (in progress)
- ☐ Billing analysis (in progress)
- ☐ Drive by audit (potential future step)

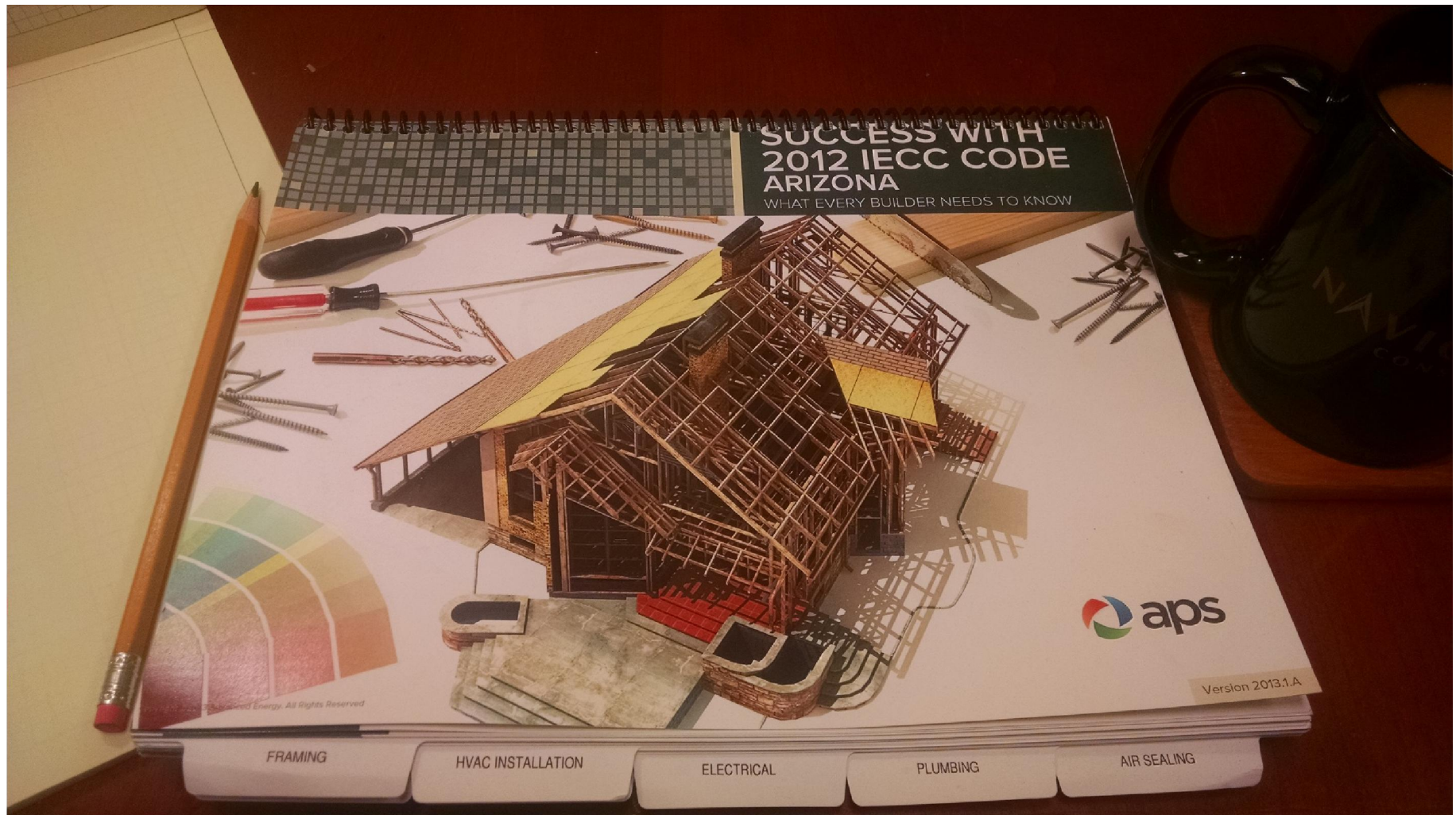
## ■ Commercial technique:

- ☐ Remote audit or billing analysis to verify EUI (potential future step)





# Compliance training “pre-test”



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# Net savings: NOMAD/NOSAD

- NOMAD – market adoption
  - Convene Delphi panel
- NOSAD – standards adoption
  - Utility can only claim savings for as long as the code is not superseded
  - 3 years for IECC and ASHRAE 90.1 in this case



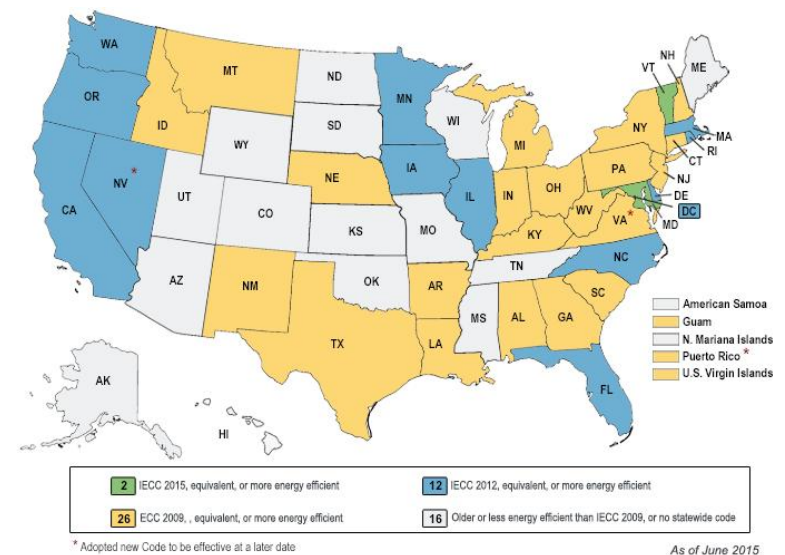
# Attribution-the sticky question

- In AZ, the ACC mandates a 1/3 discount to savings
- Argument for different attribution discounts for different jurisdictions

☐ Federal

☐ State

☐ local



# Strategies to discuss on the cruise



## Thanks for your attention!

# Key CONTACTS



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